NHP SAFETY REFERENCE GUIDE

GSR

SAFETY FUNCTION DOCUMENTS

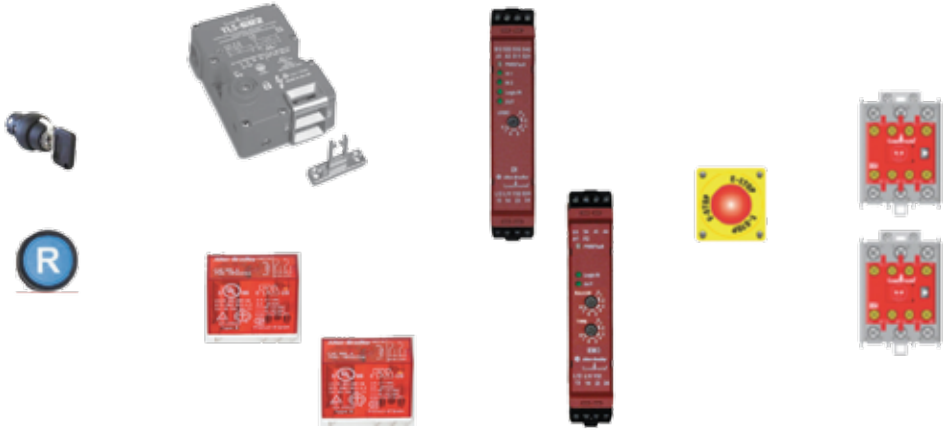
Guard Door
Locking Safety
Function

Authorised Distributor

Safety Function Documents

Door Locking and Monitoring
Products: TLSZR-GD2 / Guardmaster® Safety Relays

Safety Rating: PLe, Cat. 4 to EN ISO 13849.1 2008



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Safety Function Documents

Door Locking and Monitoring Products: TLSZR-GD2 / Guardmaster® Safety Relays

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Introduction

This Safety Function application note explains how to wire, configure, and integrate a GSR DI and EMD to monitor a TLSZR-GD2 and prevent access while hazardous motion is present in the guarded area. An E-Stop safety function is also integrated into the safety system. The GSR DI monitors the TLSZR-GD2 and E-Stop to detect any faults in their operational state or faults in the circuits. The GSR DI and EMD monitor their internal circuits for any faults. Faults will not lead to the system performing its safety functions on demand, stopping the hazardous motion. The system cannot be reset once the safety function has been performed until the fault has been corrected.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation® sales office or online at http://www.rockwellautomation.com/literature) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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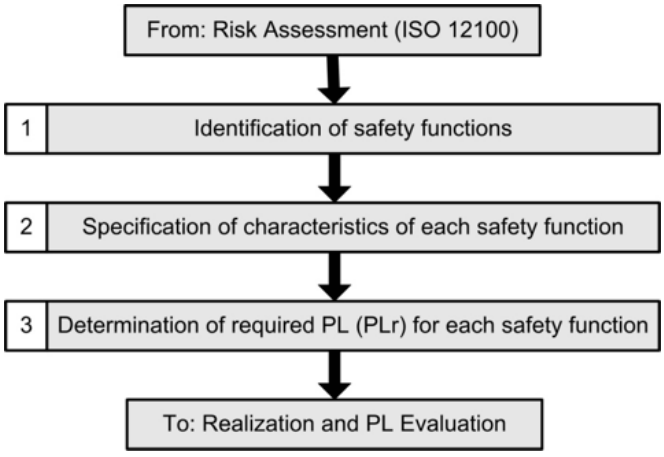
Safety Function Realization: Risk Assessment

The performance level required is the result of a risk assessment and refers to the amount of the risk reduction to be carried out by the safety-related parts of the control system. Part of the risk reduction process is to determine the safety functions of the machine. For the purposes of this document the assumed required performance level (PLr), for each Safety Function is PLe, Category 4. A safety system that achieves PLe, Category 4, or higher, can be considered control reliable.


From: Risk Assessment (ISO 12100)
1
Identification of safety functions
2
Specification of characteristics of each safety function
3
Determination of required PL (PLr) for each safety function
To: Realization and PL Evaluation

Guard Locking Interlock Safety Function

This application note includes two Safety Functions:

1. Prevention of access to hazardous motion in the guarded area.
2. Emergency stop of hazardous motion initiated by an E-Stop button.

This system provides a Stop Category 0 stop; power is removed and the hazardous motion coasts to a stop.

Safety Function Documents

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Safety Functional Requirements

Access to hazardous motion is prevented by using an interlocked guard door with guard locking. Once motor power has been removed, the guard door will remain closed and locked for a predetermined amount time to confirm the hazardous motion is stopped. At such time, the operator is allowed to unlock the door by applying power to the guard lock using the key switch. While the door is open, it is monitored to prevent an unexpected start-up. Upon closing of the door, hazardous motion and power to the motor will not resume until a secondary action (start button depressed) occurs.

Faults at the door interlock switch, wiring terminals or safety controller will be detected before the next safety demand. The stop time of the machine must be established such that the hazardous motion must be stopped before the user can reach the hazard.

The safety function in this example is capable of connecting and interrupting power to motors rated up to 9A, 600VAC. The safety function will meet the requirements for Category 4, Performance Level "e" (Cat. 4, PLe), per ISO 13849-1, and SIL3 per IEC 62061, and control reliable operation per ANSI B11.19.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
	ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
	SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

General Safety Information

Contact Rockwell Automation to find out more about our safety risk assessment services.

IMPORTANT	This application example is for advanced users and assumes that you are trained and experienced in safety system requirements.
	ATTENTION: A risk assessment should be performed to make sure all task and hazard combinations have been identified and addressed. The risk assessment may require additional circuitry to reduce the risk to a tolerable level. Safety circuits must take into consideration safety distance calculations which are not part of the scope of this document.

Functional Safety Description

In this application example the access gate is locked during normal operation. The GSR DI uses pulse checking to monitor the E-Stop for actuation and faults.

The TLSZR monitors itself for faults, lock status and gate actuation. When a fault is detected or the gate is unlocked or open the TLSZR turns off both its OSSD outputs. The GSR DI de-energizes the redundant safety contactors (K1 and K2) removing power to the hazardous motion upon actuation of the E-Stop or the TLSZR turning off its OSSD outputs. The hazardous motion coasts to a stop in a maximum of 20 seconds (Stop Category 0). The EMD delays power to the access gate release key switch while the hazardous motion is running in normal operation and for 30 seconds after power is removed from the hazardous motion in response to actuation of the E-Stop.

Once power is provided to the gate release key switch via K1, K2 and K3 NC aux contacts, turning the key to the right energizes the solenoid unlocking the TLSZR-GD2 and the gate may be opened.

The operator removes the key so that the gate cannot be locked nor the system reset with the operator in the hazardous area.

The system cannot be reset until the gate is closed and locked by inserting the key and turning it to the left and the E-Stop is released. The Reset button must be pressed for more than a quarter second and less than three seconds. A shorter press will be ignored; a longer press will be ignored.

Safety Function Documents

Door Locking and Monitoring
Products: TLSZR-GD2 / Guardmaster® Safety Relays

Safety Rating: PLe, Cat. 4 to EN ISO 13849.1 2008

Bill of Material

Cat. No.	Description	Quantity
800F-1YP3	800F 1-Hole Enclosure E-Stop Station, Plastic, PG, Twist-to-Release 40mm, Non-Illuminated, 2 N.C.	1
440G-TZS21UPRH	GuardLock, RFID Door Monitoring, Power to Release	1
800FM-G611MX10	800F Push Button - Metal, Guarded, Blue, R, Metal Latch Mount, 1 N.O. Contact(s) - Reset	1
800FM-KM22MX11	800F 2 position Key Selector Switch, Right Key Removal, 1 N.O., 1 N.C. - Gate Release	1
440R-D22R2	Guardmaster Safety Relay, 2 Dual Channel Universal Inputs, 1 N.C. Solid State Auxiliary Outputs	1
440R-EM4R2D	Guardmaster Safety Relay, Expansion Module (Single Wire Safe is only input), N/A Auxiliary Outputs	1
100S-C09ZJ23C	MCS 100S-C Safety Contactor, 9A, 24V DC	2
700-HPS2Z24	700-HPS Safety Relay, DPDT, 8A, 24V DC - K3 & K4	2
700-HN123	Socket, DIN mount - K3 & K4	2
700-HN119	Retainer Clip - K3 & K4	2
855EP-G24Y3L5	Control Tower Stack Light, Pre-Assembled, 10 cm Pole Mount with Cap, Gray Housing, 24V AC/DC Full Voltage, Green Steady LED, Amber Flashing Light	1

Setup and Wiring

For detailed information on installing and wiring, refer to the product manuals listed in the **Additional Resources**.

System Overview

The GSR DI monitors the E-Stop by running its S11 and S21 pulsed outputs through the two channels of the E-Stop to inputs S12 and S22 respectively. A loose wire, a shorted contact, a short to 24V, a short to 0V or a cross fault between the channels will be detected by the DI.

The TLSZR is a fully self monitoring device. When faults are detected the TLSZR responds by turning off both its OSSD outputs.

The GSR DI monitoring both the E-Stop and the TLSZR outputs responds to any faults or demands from the devices by de-energizing its safety contacts removing power from the coils of the redundant 100S safety contactors (K1 and K2). At the same time, via the Single Wire Safety (SWS) connection, the GSR DI starts the EMD 30 second delay off function. The hazardous motion coasts to a stop in no more than 20 seconds.

After the 30 second delay the EMD de-energizes it safety contacts removing power from the coil of interposing relays K3 and K4. With K1, K2, K3 and K4 de-energized 24V is available at the gate release key switch. Turning the key switch to the right energizes the solenoid of the TLSZR unlocking the gate. The key can be removed when in the “right” position. Once the key is removed the gate cannot be locked nor the system reset.

The gate must be closed, the key inserted and turned to the left locking the gate before the reset button will function. The key cannot be removed when in the “Left” position.

In this example the hazardous motion has ceased before access to the guarded area can occur. In essence there is no danger.

Safety Function Documents

Door Locking and Monitoring
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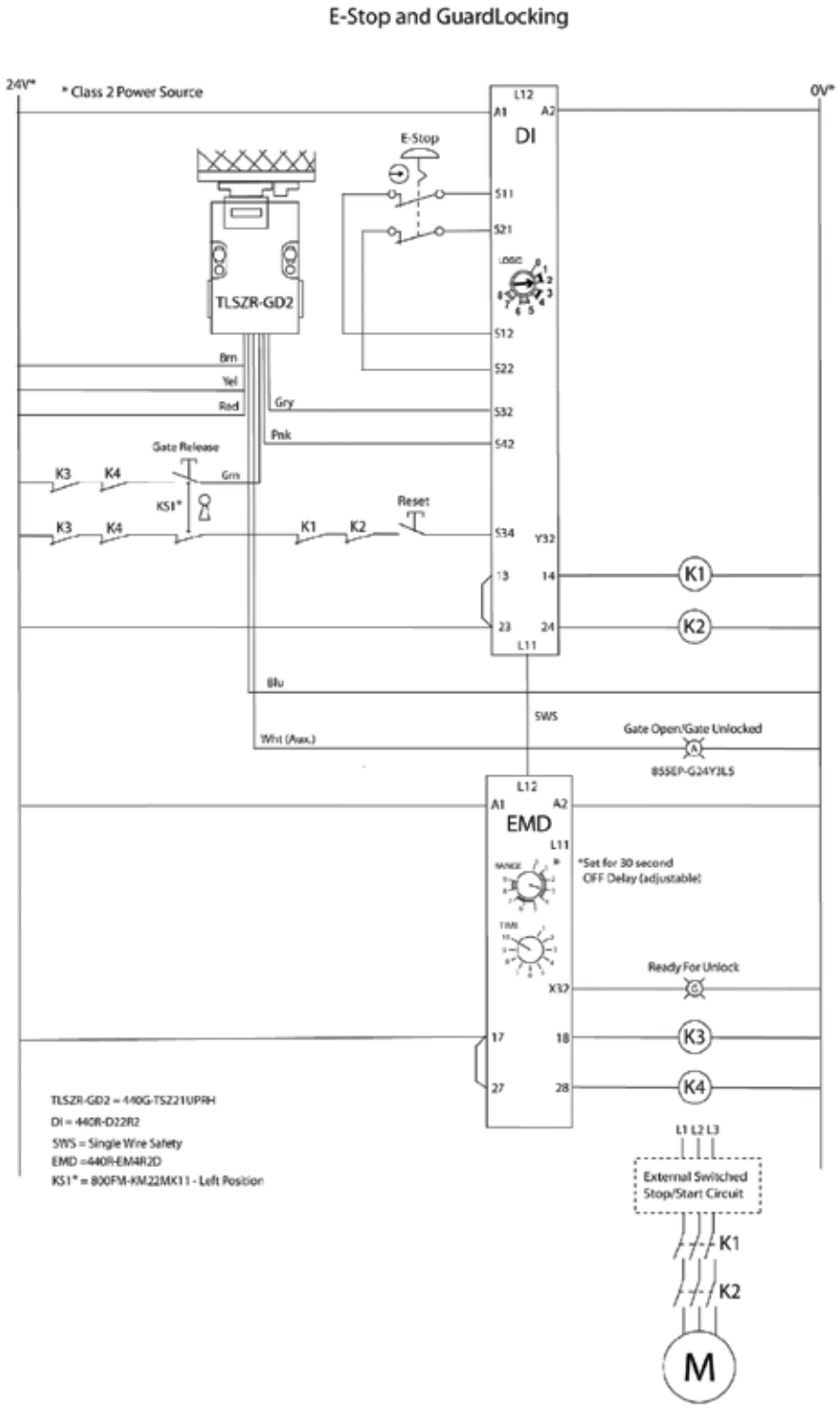
Safety Rating: PLe, Cat. 4 to EN ISO 13849.1 2008

Electrical Schematic



Safety Function Documents

Door Locking and Monitoring
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Safety Rating: PLe, Cat. 4 to EN ISO 13849.1 2008

Configuration

Configure the DI

C The following procedure sets the function of the device:

1. Start configuration/overwrite: with power off, turn rotary switch to position "0" and unit is powered up. After power-up test, "PWR" LED will flash red.
2. Set configuration: turn rotary switch to position "2". IN 1 LED blinks new setting.
   NOTE: Position is set when "PWR" LED is solid green.
3. Lock in configuration by cycling unit power.
4. Configuration must be confirmed before operation. A white space on face of device is provided to record unit setting.

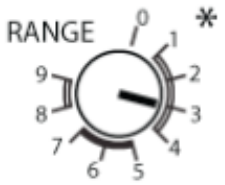
Logic "2" = L12 OR (IN 1 AND IN 2)

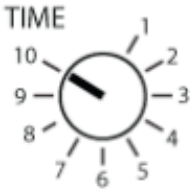
Configure the EMD

C The following steps describe timing configuration. Both switches need to be set. LED B1 indicates position of "RANGE" and Logic IN of "TIME."

1. Start configuration/overwrite: with power off, turn rotary switch "RANGE" to position "0" and power unit up. After power-up test, "PWR" LED will flash red.
2. Set configuration: turn rotary switch to desired position, both "RANGE" (3) and "TIME" (10). B1 and Logic IN LED blink new setting.
   NOTE: Position is set when "PWR" LED is solid green.
3. Lock in configuration by cycling unit power.
4. Configuration must be confirmed before operation. A white space on face of device is provided to record unit setting.

*Set for 30 second OFF Delay





Safety Function Documents

Door Locking and Monitoring
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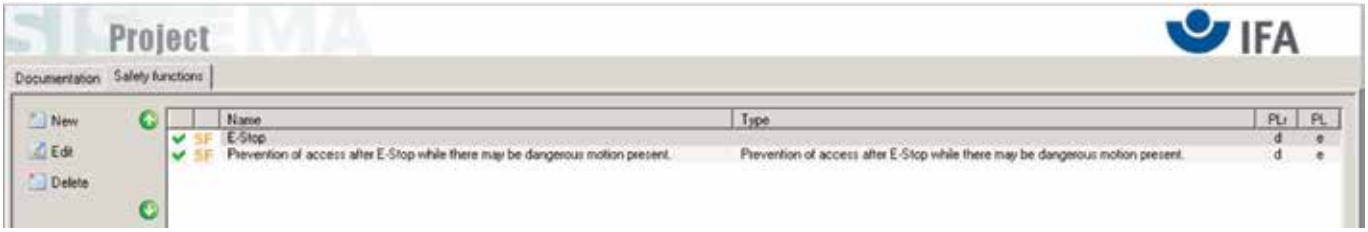
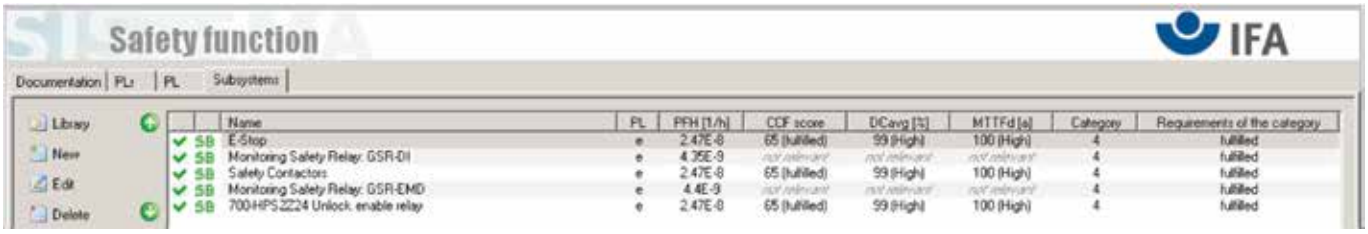
Calculation of the Performance Level

When configured and installed properly, the two Safety Functions of this safety system, prevention of access to hazardous motion in the guarded area and emergency stop of hazardous motion initiated by an E-Stop button, can achieve a safety rating of PLe, Cat. 4 according to EN ISO 13849.1 2008. As calculated using the SISTEMA tool.

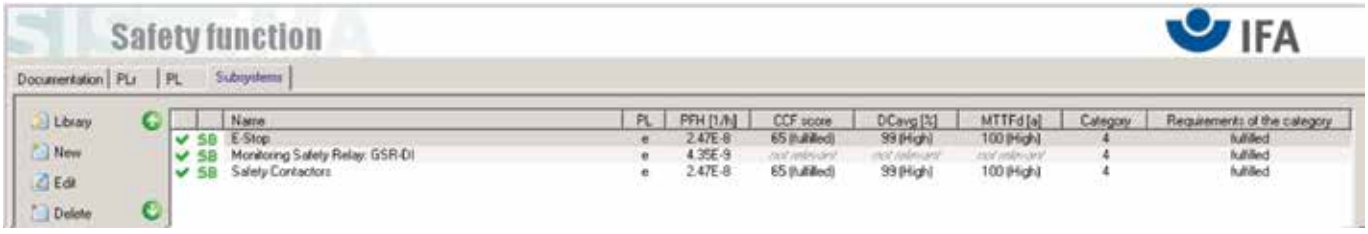
Door Monitoring and Locking Project



Prevention of access to hazardous motion in the guarded area Safety Function.



Emergency stop of hazardous motion initiated by an E-Stop button Safety Function.



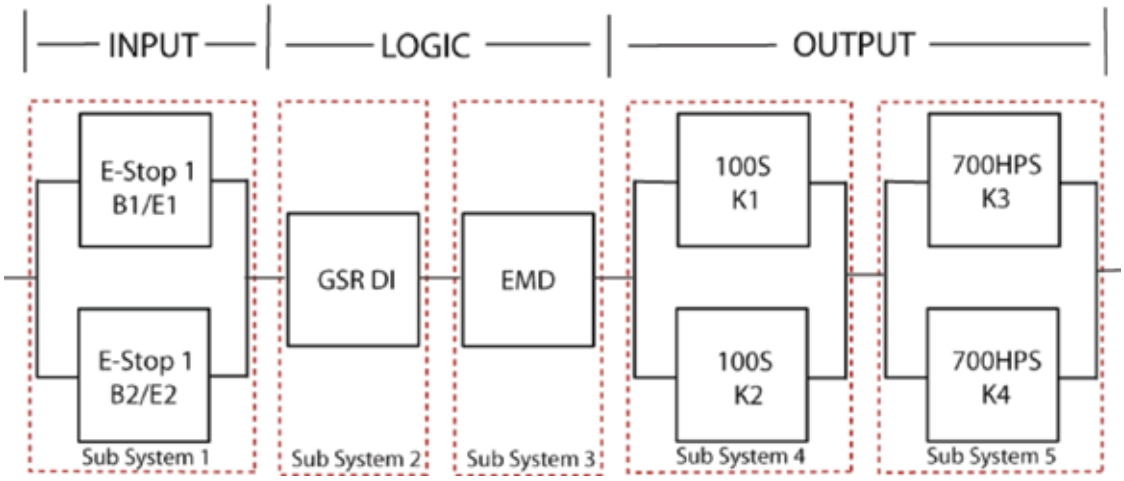
Safety Function Documents

Door Locking and Monitoring
Products: TLSZR-GD2 / Guardmaster® Safety Relays

Safety Rating: PLe, Cat. 4 to EN ISO 13849.1 2008

Calculation of the Performance Level cont

The prevention of access to hazardous motion in the guarded area Safety Function can be modeled as below.



The Function Safety data for the E-Stop Input subsystem is:

SB E-Stop	
PL	e
PFH [1/h]	2.47E-8
Cat.	4
MTTFd [a]	100 (High)
DCavg [%]	99 (High)
CCF	65 (fulfilled)

The Functional Safety data for the GSR DI Logic subsystem is:

SB Monitoring Safety Relay: GSR-DI	
PL	e
PFH [1/h]	4.35E-9
Cat.	4
MTTFd [a]	*not relevant*
DCavg [%]	*not relevant*
CCF	*not relevant*

Safety Function Documents

Door Locking and Monitoring
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Calculation of the Performance Level cont

The Functional Safety data for the EMD Logic subsystem is:

SB Monitoring Safety Relay: GSR-EMD	
PL	e
PFH [1/h]	4.4E-9
Cat.	4
MTTFd [a]	*not relevant*
DCavg [%]	*not relevant*
CCF	*not relevant*

The Functional safety data for the 100S Output subsystem is:

SB Safety Contactors	
PL	e
PFH [1/h]	2.47E-8
Cat.	4
MTTFd [a]	100 (High)
DCavg [%]	99 (High)
CCF	65 (fulfilled)

The Functional Safety data for the 700HPS Output subsystem is

SB Safety Contactors	
PL	e
PFH [1/h]	2.47E-8
Cat.	4
MTTFd [a]	100 (High)
DCavg [%]	99 (High)
CCF	65 (fulfilled)

Safety Function Documents

Door Locking and Monitoring
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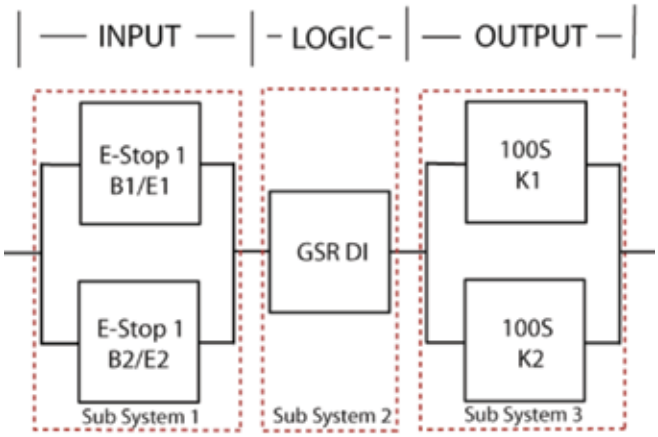
Safety Rating: PLe, Cat. 4 to EN ISO 13849.1 2008

Calculation of the Performance Level cont

Emergency stop of hazardous motion initiated by an E-Stop button Safety Function can be modeled as below.



The Functional Safety data for the E-Stop Input subsystem is:

SB E-Stop	
PL	e
PFH [1/h]	2.47E-8
Cat.	4
MTTFd [a]	100 (High)
DCavg [%]	99 (High)
CCF	65 (fulfilled)

The Functional safety data for the GSR DI Logic subsystem is:

SB Monitoring Safety Relay: GSR-DI	
PL	e
PFH [1/h]	4.35E-9
Cat.	4
MTTFd [a]	*not relevant*
DCavg [%]	*not relevant*
CCF	*not relevant*

Safety Function Documents

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Calculation of the Performance Level cont

The Functional Safety data for the 100S Output subsystem is:

5B Safety Contactors	
PL	e
PFH [1/h]	2.47E-8
Cat.	4
MTTFd [a]	100 (High)
DCavg [%]	99 (High)
CCF	65 (fulfilled)

Note that the E-Stop, 100S contactor and 700HPS relay data includes MTTFd, DCavg, and CCF data. This is because these are electromechanical devices. Electromechanical devices functional safety evaluations include how frequently they are operated, whether they are effectively monitored for faults and properly specified and installed.

SISTEMA calculates the MTTFd using B10d data provided for the contactors along with the estimated frequency of use entered during the creation of the SISTEMA project. This application example presumes that the E-Stop is operated or tested once per day or 365 times a year.

The DCavg (99%) for the contactors was selected from the Output Device table of EN ISO 13849-1 Annex E. “Direct Monitoring”.

The DCavg (99%) for the E-Stop was selected from the Input Device table of EN ISO 13849-1 Annex E. “Cross Monitoring”.

The (CCF) value is generated using the scoring process outlined in Annex F of ISO 13849-1.
The complete CCF scoring process must be done when actually implementing an application.
A minimum score of 65 points must be achieved. A CCF of 65 was entered for practical purposes in each case for this application example.

Verification and Validation Plan

Verification and Validation play an important role in the avoidance of faults throughout the safety system design and development process. ISO/EN 13849-2 sets the requirements for verification and validation. It calls for a documented plan to confirm all the Safety Functional Requirements have been met.

Verification is an analysis of the resulting safety control system. The Performance Level (PL) of the safety control system is calculated to confirm it meets the Required Performance Level (PLr) specified. The SISTEMA software tool is typically utilized to perform the calculations and assist with satisfying the requirements of ISO 13849-1.

Validation is a functional test of the safety control system to demonstrate that it meets the specified requirements of the safety function. The safety control system is tested to confirm all of the safety related outputs respond appropriately to their corresponding safety related inputs. The functional test should include normal operating conditions in addition to potential fault inject of failure modes. A checklist is typically used to document the validation of the safety control system.

Prior to validating the GSR Safety Relay system, it is necessary to confirm the GSR Relay has been wired and configured in accordance with the Installation Instructions.

Safety Function Documents

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GSR Door Monitoring Safety Function Verification and Validation Checklist

GENERAL MACHINERY INFORMATION	
Machine Name / Model Number	
Machine Serial Number	
Customer Name	
Test Date	
Tester Name(s)	
Schematic Drawing Number	
Guardmaster Safety Relay Model	

Safety Wiring and Relay Configuration Verification			
Test Step	**Verification**	**Pass/Fail**	**Changes/Modifications**
	Visually inspect the safety relay circuit is wired as documented in the schematics.		
	Visually inspect the safety relay rotary switch settings are correct as documented.		

Normal Operation Verification - The safety relay system properly responds to all normal Start, Stop, Estop and Reset Commands			
Test Step	**Verification**	**Pass/Fail**	**Changes/Modifications**
	Initiate a Start Command. Both contactors should energize for a normal machine run condition. Verify proper machine status indication and safety relay LED indication.		
	Initiate a Stop Command. Both contactors should de-energize for a normal machine Stop condition. Verify proper machine status indication and safety relay LED indication.		
	While Running, open the monitored guard door. Both contactors should de-energize and open for a normal safe condition. Verify proper machine status indication and safety relay LED indication. Repeat for all guard doors.		
	While Stopped, with the guard door open, initiate a Start Command. Both contactors should remain de-energized and open for a normal safe condition. Verify proper machine status indication and safety relay LED indication. Repeat for all door locks.		
	Initiate Reset Command. Both contactors should remain de-energized. Verify proper machine status indication and safety relay LED indication.		

Abnormal Operation Verification - The Safety Relay system properly responds to all foreseeable faults with corresponding diagnostics. Door Monitoring Input Tests			
Test Step	**Validation**	**Pass/Fail**	**Changes/Modifications**
	While Running, remove the Channel 1 wire from the safety relay. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for Channel 2.		
	While Running, short the Channel 1 of the safety relay to +24VDC. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for Channel 2.		
	While Running, short the Channel 1 of the safety relay to (-) 0VDC. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for Channel 2.		
	While Running, short Channels 1 & 2 of the safety relay. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication.		

GSR Logic Solver Tests			
Test Step	**Validation**	**Pass/Fail**	**Changes/Modifications**
	While Running, remove the single wire safety connection between two adjoining safety relays in the system. All contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for all safety connections. This test is not applicable for single relay circuits.		
	While Running, turn the logic rotary switch on the safety relay. All contactors should remain de-energized. Verify proper machine status indication and safety relay LED indication. Repeat for all safety relays in the system.		

Safety Contactor Output Tests			
Test Step	**Validation**	**Pass/Fail**	**Changes/Modifications**
	While Running, remove the contactor feedback from the safety relay. All contactors should remain energized. Initiate a Stop Command followed by a Reset Command. The relay should not restart or reset. Verify proper machine status indication and safety relay LED indication.		

Safety Function Documents

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GSR Door Monitoring Safety Function Verification and Validation Checklist cont

GENERAL MACHINERY INFORMATION	
Machine Name / Model Number	
Machine Serial Number	
Customer Name	
Test Date	
Tester Name(s)	
Schematic Drawing Number	
Guardmaster Safety Relay Model	

Safety Wiring and Relay Configuration Verification			
Test Step	**Verification**	**Pass/Fail**	**Changes/Modifications**
	Visually inspect the safety relay circuit is wired as documented in the schematics.		
	Visually inspect the safety relay rotary switch settings are correct as documented.		

Normal Operation Verification - The safety relay system properly responds to all normal Start, Stop, Estop and Reset Commands			
Test Step	**Verification**	**Pass/Fail**	**Changes/Modifications**
	Initiate a Start Command. Both contactors should energize for a normal machine run condition. Verify proper machine status indication and safety relay LED indication.		
	Initiate a Stop Command. Both contactors should de-energize for a normal machine Stop condition. Verify proper machine status indication and safety relay LED indication.		
	While Running, press the E-Stop pushbutton. Both contactors should de-energize and open for a normal safe condition. Verify proper machine status indication and safety relay LED indication. Repeat for all E-Stop pushbuttons.		
	While Stopped, press the E-Stop pushbutton, initiate a Start Command. Both contactors should remain de-energized and open for a normal safe condition. Verify proper machine status indication and safety relay LED indication. Repeat for all E-Stop pushbuttons.		
	Initiate Reset Command. Both contactors should remain de-energized. Verify proper machine status indication and safety relay LED indication.		

Abnormal Operation Verification - The Safety Relay system properly responds to all foreseeable faults with corresponding diagnostics. E-Stop Input Tests			
Test Step	**Validation**	**Pass/Fail**	**Changes/Modifications**
	While Running, remove the Channel 1 wire from the safety relay. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for Channel 2.		
	While Running, short the Channel 1 of the safety relay to +24VDC. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for Channel 2.		
	While Running, short the Channel 1 of the safety relay to (-) 0VDC. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for Channel 2.		
	While Running, short Channels 1 & 2 of the safety relay. Both contactors should de-energize. Verify proper machine status indication and safety relay LED indication.		

GSR Logic Solver Tests			
Test Step	**Validation**	**Pass/Fail**	**Changes/Modifications**
	While Running, remove the single wire safety connection between two adjoining safety relays in the system. All contactors should de-energize. Verify proper machine status indication and safety relay LED indication. Repeat for all safety connections. This test is not applicable for single relay circuits.		
	While Running, turn the logic rotary switch on the safety relay. All contactors should remain. de-energized. Verify proper machine status indication and safety relay LED indication. Repeat for all safety relays in the system.		

Safety Contactor Output Tests			
Test Step	**Validation**	**Pass/Fail**	**Changes/Modifications**
	While Running, remove the contactor feedback from the safety relay. All contactors should remain energized. Initiate a Stop Command followed by a Reset Command. The relay should not restart or reset. Verify proper machine status indication and safety relay LED indication.		

Safety Function Documents

Door Locking and Monitoring Products: TLSZR-GD2 / Guardmaster® Safety Relays

Safety Rating: PLe, Cat. 4 to EN ISO 13849.1 2008

Additional Resources

For more information about the products used in this example refer to these resources.

Document	Pub. No.	Description
Guard Locking Switch Installation Instructions	440G-IN007	How to install, commission, operate and maintain the 440G-TZS21UPRH
Guardmaster Safety Relay Installation Instructions	10000175129	How to install, commission, operate and maintain the 440R-D22R2 Safety Relays
Guardmaster Safety Relay Troubleshooting Guide	440R-TG002	How to troubleshoot the 440RD22R2 Safety Relays
Guardmaster Expansion Relay Installation Instructions	440R-IN045	How to install, commission, operate and maintain the 440R-EM4R2D Expansion Relay
Guardmaster Expansion Relay Troubleshooting Guide	440R-TG001	How to install, commission, operate and maintain the 440R-EM4R2D Expansion Relay
Safety Products Catalog	S117-CA001A	Overview of Safety products, product specifications, and application examples
GuardShield Type 4 User Manual	440L-UM003	How to install, operate, and maintain the 440L Safety Light Curtains
Next Generation Guardmaster Safety Relays	SAFETY-WD001	Functional descriptions, guidance, and wiring for Safety Relays
Heavy Duty Guard Interlock Switch Installation Instructions	440K-IN008	How to install, configure, commission, operate, and maintain MT-GD2 Interlock Switches
Trojan T15 Interlock Switch Installation Instructions	440K-IN003	How to install, configure, commission, operate, and maintain Trojan T15 Interlock Switches
Safety Interlock Switches Brochure	EUSAFE-BR001	Overview of Interlock Switches
Guardmaster Safety Relay SI Installation Instructions	440R-IN042	How to install, configure, commission, operate, and maintain GSR SI Safety Relays
Guardmaster Safety Relays Selection Guide	440R-SG001	Overview of Guardmaster Safety Relays
RightSight Photoelectric Sensor Installation Instructions	42EF-IN003	How to install, commission, operate, and maintain 42EF Photoelectric Sensors
MSR42 Control Module User Manual	440R-UM008	How to install, commission, operate, and maintain MSR42 Systems
MSR45E Safety Relay Expansion Module User Manual	440R-UM007	How to install, commission, operate, and maintain the MSR45E Expansion Module
SensaGuard Integrated Latch Unique Coded Installation Instructions	440N-IN011	How to install, commission, operate, and maintain the SensaGuard
Touch Button and Guard Installation Instructions	800Z-IN001-MU	How to install and mount the 800Z Touch Button
Zero-Force Touch Buttons Family Brochure	800Z-BR002	Brochure that describes all 800Z Palm Buttons
MSR12T Safety Relays Installation Instructions	MINOTR-IN010	How to install, configure, commission, operate, and maintain the MSR 12T Safety Relays
Guardmaster Safety Relay Installation Instructions	440R-IN042	How to install, commission, operate and maintain the 440R-S12R2 Safety Relays

Safety Function Document

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Risk assessments should be conducted by authorized persons. The purchaser and installer are responsible for ensuring the safety system(s) incorporating these products complies with all current regulations and applicable standards.

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